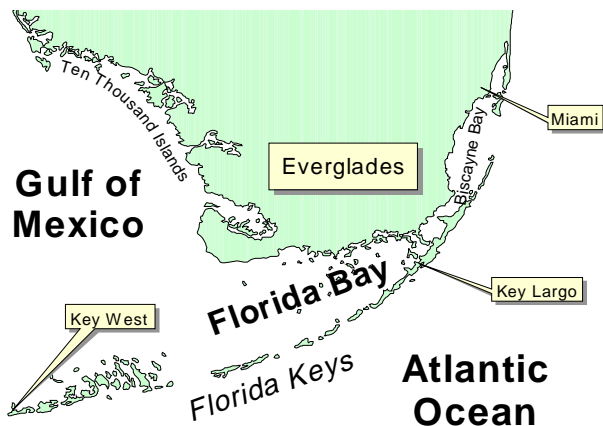


## South Florida Fish Ecology and Contaminants Team NOAA BEAUFORT LABORATORY

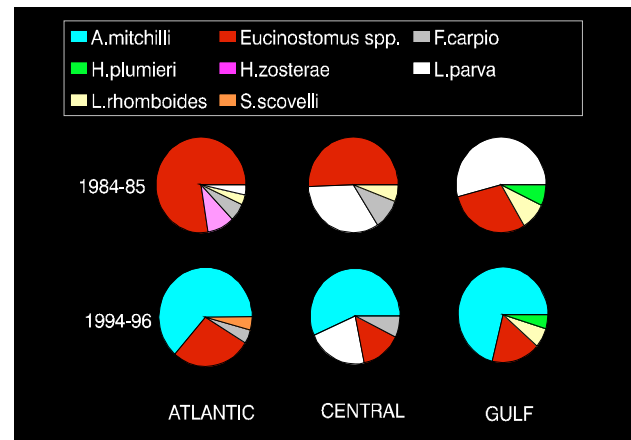
South Florida is a microcosm of many of the challenges facing the nation's coastal zone. Urban development, intensive agriculture, and fisheries exploitation lie close by some of the most unique natural environments in the country such as the Everglades wetlands and the coral reefs along the Florida Keys. Water diversions have altered watersheds supporting both human activities and natural functioning in the area.



Beaufort Laboratory staff have been conducting fisheries and habitat related research in Everglades National Park for more than 15 years in Florida Bay, Ten Thousand Islands, and Biscayne Bay. Florida Bay, a relatively pristine marine environment, is bounded on the north by mainland Florida, south and east by the Florida Keys and west by the Gulf of Mexico. The bay has a unique setting, with shallow

banktops and basins connected by narrow channels. Scattered throughout the bay are mangrove islands.

Between 1987 and 1991, rapid changes occurred in the bay. A drought raised the salinity of the bay to as much as twice that (70 parts per thousand) of the ocean. In the fall of 1987 large areas of sea grasses began to die throughout much of Florida Bay. An increase in turbidity and algae blooms accompanied the die-off. A massive die-off of sponges followed, reducing a vital habitat for juvenile spiny lobsters. Coupled with these events were continued diversions of water from the Everglades for agriculture, flood control, and urban water supply. Water that historically flowed through the Everglades ("River of Grass") was diverted away from Florida Bay. The natural and man-induced events that occurred heightened concern for the health and integrity of south Florida ecosystems.



*Changes in fish composition during a period when dramatic environmental changes were occurring in Florida Bay.*

We have been concerned with how these changes might have influenced the fish community of Florida Bay. A study was undertaken in 1994-95, duplicating one conducted by Beaufort Laboratory a decade earlier. We found that densities of sea grasses had declined by as much as 100% in some areas. The total abundance of fishes did not decline, but the fish community composition and diversity changed. Species utilizing the sea grass canopy or dwelling close to the bottom declined; those species that occur in open water, particularly anchovies, increased markedly in abundance. A major change in the feeding regime in Florida Bay seems to have occurred.



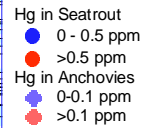
*Sampling for juvenile fishes using a bottom sled.*

We continue to sample in Florida Bay and adjacent waters to monitor the distribution and abundance of fishes in response to recently introduced water management policies redirecting increased freshwater from the Everglades into Florida Bay. A change in salinities is likely to occur in certain areas. A major interest is the status of spotted seatrout. We are examining their spawning and growth as larvae and juveniles in relation to salinity changes. Growth rates in young stages are a good indicator of survival; faster growing fish generally survive better. Increment counting of otoliths is a valuable tool we employ in measuring growth. Otoliths (earstones) exhibit rings laid down daily from which the birth date, age, and growth rate can be estimated for fish as small as 2 mm. Laboratory experiments on trout are being used to predict how future salinity patterns will influence seatrout spawning, growth, and distribution in Florida Bay.

Studies on the early life of snappers and grunts, which spawn outside Florida Bay, but use the bay as a nursery area are being carried out. Growth of juveniles is measured to determine the suitability of different regions of Florida Bay. Studies have begun to sample fishes in offshore waters on a quarterly basis, with sampling for juveniles within Florida Bay following one month later. The birth dates of larvae collected offshore will be compared to those that successfully make it to the nursery areas. By also determining birth dates of juvenile fishes, spawning groups will be identified and environmental conditions suitable for fast growth and survival in offshore waters will be linked to growth and survival in the bay.

highest mercury concentrations in fish. Agricultural pesticides have been shown to follow this route in studies by Geoff Scott of NOAA's Center for Coastal Environmental Health and Biomolecular Research at Charleston SC. The configuration of Florida Bay with numerous mudbanks

### Mercury in Spotted Seatrout and Anchovies



restricts water movement and makes the inner bay vulnerable to introductions of pollutants which are not readily flushed out to sea. We have shown that mercury is most concentrated in the top predators and in forage fishes that feed in the water column (for example, spotted seatrout and anchovies) relative to those that feed near the bottom or in sea grass canopies (for example, red drum and gray snapper). This suggests that the water column is an indirect source of elevated mercury to top predators and is consistent with the finding that the source of mercury is Everglades freshwater runoff. We are hoping to be able to predict how restoring historic water flows from the Everglades to the bay will alter mercury concentrations in top predators.

Mercury and certain persistent contaminants are transferred to top predators through the prey they feed upon. We are analyzing the stable isotopes of carbon, nitrogen and sulfur in the various food web organisms supporting top predators in order to better trace the pathways that can lead to high contaminant concentrations in top predators in Florida Bay and other south Florida coastal areas.

**Team Members:** Allyn Powell (leader), Rob Cheshire, Al Crosby, Peter Crumley, David Evans, Mike Johnson, Mike LaCroix

<http://shrimp.bea.nmfs.gov>

Contaminants can flow into Florida Bay and other south Florida estuaries with freshwater supplied by their watersheds. The Everglades supplies such water to Florida Bay and the mangrove estuaries of the Ten Thousand Islands area to the west. Mercury is found in high concentrations in freshwater fish from the Everglades and may be supplying mercury to Florida Bay fish as well. The eastern half of Florida Bay nearest Everglades runoff has